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**INTERNAL REVIEW
OF THE
MINISTRY OF ENVIRONMENT AND ENERGY
RESPONSE TO THE PLASTIMET FIRE
CITY OF HAMILTON
JULY 9-12, 1997**

OCTOBER 1997



Ontario

**Ministry of
Environment
and Energy**

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JULY 9-12, 1997

Report prepared by:

Ontario Ministry of Environment and Energy
October 1997

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EXECUTIVE SUMMARY

The Ministry of Environment and Energy has completed an internal review of the Ministry's response to the July 9, 1997 Plastimet fire. The review was conducted to determine if the Ministry fulfilled its expected role during the early stages of this occurrence in accordance with Ministry guidelines and procedures. The purpose of this report is to document the findings of this internal review and provide recommendations for improvements where warranted.

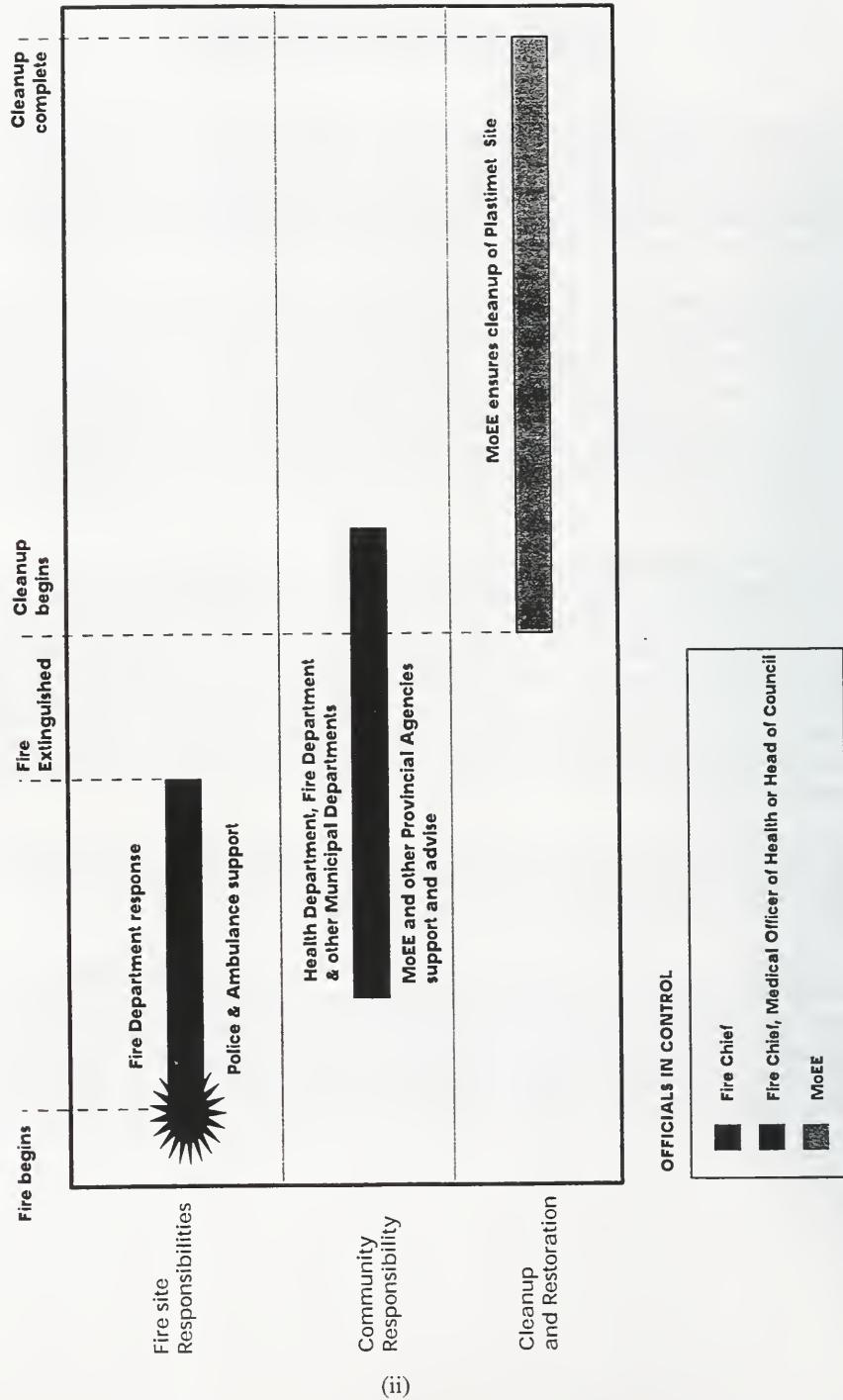
The **Emergency Plans Act** in conjunction with the **Provincial Emergency Plan**, both of which are administered by the Solicitor General through Emergency Measures Ontario, provide the framework for emergency planning and preparedness in the province. As a general principle, most emergencies are managed by municipal first responders (police, fire and health services) either as a matter of routine or by implementing their emergency plans and procedures, with or without declaring a municipal emergency. Normally, response to an emergency begins at municipal or community level and escalates where needed to involve successively higher levels of government.

Ministry plans and procedures for dealing with spills and related emergencies focus on environmental concerns and are subordinate to those plans and procedures that are required to deal with the protection of life and property. The Ministry is not a first responder to fires or spills. The primary responsibility for public health and safety in the case of an emergency rests with the municipality, which is encouraged to have or prepare emergency plans and procedures to deal with threats to life, limb and property. The Fire Chief and/or Medical Officer of Health are responsible for orders or advisories to evacuate or shelter during fire related emergencies. These decisions are almost always made without benefit of test results from sophisticated air monitoring equipment.

A simplified schematic of the multi-agency response to the Plastimet fire is shown in Figure 1. It summarizes key responsibilities of responding agencies and indicates which officials are typically in control at the various stages of response.

When a spill is a component of a larger emergency, Ministry environmental resources and personnel assist agencies at the scene by providing information and advice in accordance with the Ministry's capability and expertise. In order to meet its responsibilities related to spills and emergencies, the Ministry operates a 24-hour spill reporting and response coordination centre — Spills Action Centre (SAC) — and has three distinct levels of field response: Level 1- District, Level 2 - Regional, and Level 3 - Head Office ; all of which responded to the Plastimet fire.

Figure 1:
Multi-Agency Response to Plastimet Fire



Specific observations regarding the Ministry's response to the Plastimet fire include:

- All three levels of Ministry field response — District, Regional and Head Office — were within the planned Ministry standards for response (see Table 1).
- An earlier arrival of the Ministry's Trace Atmospheric Gas Analyzer (TAGA) on scene would not have resulted in an earlier evacuation. It was more than 24 hours after the first TAGA unit arrived on scene before an evacuation call was made based on a range of factors, including visual observation of the plume, changing meteorological conditions, reported respiratory problems and a change in the firefighting strategy.
- Air monitoring measurements for contaminants such as hydrogen chloride were all well below the occupational health limits that are often used in emergencies to determine short term health risks.

The internal review concludes that the Ministry responded to the Plastimet fire in accordance with Ministry Guidelines and Procedures.

This report makes the following recommendations aimed at improving responses to future events:

1. Review the state of Level 2 response capabilities in each of the Ministry's five regions to develop a consistent approach for activating these resources during the after-hours. Level 2 response procedures should be reviewed and tested annually.
2. While procedural difficulties in activating a Level 3 response to this occurrence have already been corrected, it is recommended that these procedures be reviewed and tested annually to ensure they are understood and can be relied upon. In addition, a Level 3 response capabilities section should be added to the Ministry's Environmental Responders training course.
3. Clarify procedures for providing additional Ministry personnel to support Level 1 and Level 2 responders during the early stages of complex emergencies of this nature and magnitude.
4. Clarify the Ministry's role and capabilities by updating and distributing the Ministry's Spills Information Booklet and clearly communicating this information with local governments and the public.
5. Evaluate alternative communications systems (equipment) that may be of benefit during major events and mechanisms for conveying information to other agencies and the public in a timely manner.

TABLE 1 - Ministry After-Hour Field Response Times

Planned Response to Environmental Incidents	Actual Response to Plastimet fire
Level 1 - District <ul style="list-style-type: none"> • Respond to a page from SAC within 30 minutes. • Begin response to scene from district office within 2 hours of speaking to SAC. • Average Level 1 Ministry response time to the scene of after-hour events after being paged by SAC is 1 hr and 52 min. 	<ul style="list-style-type: none"> • Responded to the page from SAC in 2 minutes. • Began response to scene from district office within 44 minutes. • Response time to scene after being paged by SAC was 1 hr 23 minutes.
Level 2 - Region <ul style="list-style-type: none"> • Begin response to scene from regional office within 1 to 2 hours of being contacted by SAC or regional management. • Arrive on scene within 3 to 4 hours of being contacted by SAC or regional management, depending on travel time to the scene. 	<ul style="list-style-type: none"> • Level 2 Response person was at Level 2 Response Van within 30 minutes. • Arrived on scene 50 minutes after being contacted by SAC.
Level 3 - Head Office (TAGA) <ul style="list-style-type: none"> • Begin response to the scene within 3 to 4 hours of designated Management being contacted by SAC. • Arrive on scene within 5 to 6 hours of the need for a Level 3 response being identified by Level 2 responders and/or regional management (response times may be extended if TAGA units are out doing surveys in other parts of the Province). 	<ul style="list-style-type: none"> • TAGA staff prepared equipment for mobile response and began their response to the scene within 2 hours and 37 minutes of SAC contacting the EMRB Director to request a TAGA response. • The TAGA unit arrived on scene - 4 hours after the request by SAC, 5 hrs and 45 minutes after the request from the Regional Director.

When considering the planned or typical after-hour field response times the Ministry has set for itself, it is important to recognize that it is not the Ministry's role to be a first responder on scene. As illustrated in Figure 1, much of the Ministry's involvement in incidents like the Plastimet Fire occurs during the cleanup and restoration phase. The Ministry's immediate involvement in reported after-hour occurrences is provided by the Spills Action Centre through advice and direction given over the telephone.

CHAPTER 1

PURPOSE

On the evening of Wednesday, July 9, 1997 at 20:18 hrs the Hamilton Fire Department contacted the Ministry of Environment and Energy (MOEE) Spills Action Centre to report a large structure fire in the downtown core of the City of Hamilton involving a factory believed to contain "PVCs and styrofoam". It was also suggested that PCBs may be involved. It was later learned that an estimated 400 tonnes of PVC and polyurethane foam was involved in the fire at the Plastimet Inc. plant. The fire department requested that MOEE respond in order to provide assistance at the scene of the fire.

MOEE has conducted an internal review to determine if the Ministry fulfilled its role during the early stages of this occurrence in accordance with documented Ministry guidelines and procedures, and to see what lessons could be learned to help with future events of this nature.

The primary purpose of this report is to document the findings of the Ministry's internal review of its response to the July 9, 1997 Plastimet Fire and where appropriate provide recommendations for improvements. The focus is on whether or not the Ministry's response was consistent with Ministry Guidelines and Procedures.

CHAPTER 2

BACKGROUND - MOEE's Role and Capabilities During Spills and Emergencies

The Emergency Plans Act provides the authority for local governments to formulate emergency plans and gives their Heads of Councils the authority to declare a municipal emergency, make decisions, and issue orders to safeguard property and protect the safety and welfare of the population . The Act also gives the Premier the power to declare a provincial emergency when necessary to deal with an emergency that causes widespread damage, injuries or fatalities. The Solicitor General's Emergency Measures Ontario (EMO) office administers this Act and is generally responsible for coordinating emergency preparedness and response activities throughout the province. EMO is also responsible for maintaining the Provincial Emergency Plan which serves as an umbrella plan for describing how the province will respond to a provincial emergency. The Plan also helps to explain how emergencies are responded to in Ontario and clarifies response expectations for local and provincial government agencies.

Most emergencies are managed by municipal first responders (police, fire and health services) either as a matter of routine or by implementing their emergency plans and procedures, with or without declaring a municipal emergency. Normally, response to an emergency begins at the municipal or community level and escalates where needed to involve successively higher levels of government.

The Ministry's role and responsibilities during spills and related emergencies are described in Guideline G-1 of the Ministry's Manual of Guidelines and Procedures. The Guideline clearly differentiates the Ministry's role during spills as compared to the Ministry's role during emergencies. For spills that are not emergencies, the Ministry is the lead regulatory agency except where federal jurisdiction applies (e.g. ship-source or international boundary water spills). During emergencies, the Ministry provides assistance to municipal police, fire and health officials who are required to take the lead for incidents involving threats to human health, safety, life and property.

In addition to normal business hour capabilities, the Ministry is committed to providing an immediate service for receiving, assessing and coordinating responses to spills and other environmental occurrences that are reported during the off-hours. For this purpose the Ministry's Spills Action Centre (SAC) operates a province-wide toll-free system which is staffed by trained environmental officers on a 24-hour basis. The Ministry is also committed to maintaining a network of additional resources, including hazardous substance expertise, air or water modelling/monitoring and laboratory testing capabilities. All of these resources can be accessed by SAC when required to help deal with an environmental occurrence. If the Ministry's presence is required at the scene of an after-hours occurrence, an initial (i.e., Level 1 - District) field

response can generally be provided within a reasonable time by an on-call District Office Environmental Officer who is called out at SAC's discretion. For more serious events a Level 2-Regional response can be activated through SAC making use of additional resources available from the Regional office. Serious and prolonged emergencies may require sophisticated Level 3-Head Office (TAGA) on-scene monitoring which can also be activated by SAC.

During the after-hours, SAC receives roughly 6000 pollution incident reports in an average year. Of these, about 100 are assessed to require a Level 1 field response prior to the next business day. Only 2 or 3 require a Level 2 response and less than once a year is SAC required to initiate a Level 3 response.

It is important to recognize that Ministry guidelines and procedures focus on environmental concerns and are subordinate to those plans and procedures that deal with the protection of life and property. The primary responsibility for the welfare and safety of residents rests with the municipality which is encouraged to have or prepare emergency plans and procedures to deal with threats to life, limb and property. In general, fire and/or health officials (e.g. Fire Chief and/or Medical Officer of Health) are responsible for decisions concerning the need to evacuate or shelter during fire related emergencies. These decisions are almost always made without benefit of test results from sophisticated air monitoring equipment and normally precede the Ministry's arrival on-scene. For example, during the historical 1979 Mississauga train derailment the first evacuation was called within 2 hours of the accident. Nine further stages of evacuation, including that of the Mississauga Hospital, were called prior to the commencement of air sampling by a Ministry mobile air monitoring unit 10 hours after the accident occurred.

MINISTRY ROLE DURING SPILLS

When a spill occurs, the Ministry will give the discharger adequate opportunity to respond while providing assistance in making decisions regarding response actions. The Ministry's primary role during spills is that of a regulatory agency enforcing the duties and provisions imposed by the legislation.

During spills the Ministry will perform the following actions:

- warn potentially affected parties and advise other agencies where applicable;
- determine the nature and extent of environmental damage caused by the spill;
- consult with health and safety or labour agencies where applicable;
- recommend appropriate response procedures, as required;
- evaluate the adequacy of the containment, clean-up and disposal efforts;

- enforce the duties imposed by MOEE legislation on any persons responsible;
- when necessary, facilitate or initiate prompt containment, clean-up and disposal measures, in accordance with Ministry procedures;
- make recommendations with respect to procedures or equipment for spill prevention, where applicable; and,
- document all findings, actions and recommendations.

MINISTRY ROLE DURING EMERGENCIES

When a spill is a component of a larger emergency, MOEE resources and personnel can assist the agencies at the scene. In consultation with the agency in control, the Ministry will perform the following actions:

- provide monitoring and modeling services, in accordance with the Ministry guidelines and procedures to determine the nature and extent of environmental contamination or damage which may be caused by the emergency;
- provide information and advice requested by a Medical Officer of Health, in accordance with the Ministry guidelines, procedures and expertise;
- recommend appropriate procedures to the agency in control of the emergency, when necessary;
- evaluate the adequacy of cleanup and disposal efforts;
- enforce the duties imposed by MOEE legislation on any persons responsible; and,
- document all findings, actions and recommendations.

SPILLS ACTION CENTRE

The Ministry operates an immediate service for receiving, assessing and coordinating responses to spills and related emergencies. The Spills Action Centre (SAC) provides a province-wide toll-free system which is staffed by environmental officers on a 24-hour basis. The primary role of SAC is to receive reports of spills and other urgent environmental matters at any time of the day or night and then initiate and coordinate responses to these reports.

Environmental Officers working at the Centre evaluate all reported occurrences and decide what type of action is necessary. This may include any combination of the following:

- provide immediate advice and direction to the person who reports an occurrence;
- contact suspected pollution sources in an attempt to verify and resolve reported problems;
- contact other agencies or potentially affected parties as needed, such as, police, fire departments, local municipal authorities, health officials, Canadian Coast Guard, US authorities, etc.;
- contact local MOEE personnel to initiate a Level 1 (District) field response;
- arrange for additional levels of Ministry response as required to help assess and monitor the effects of a discharge;
- coordinate communications to assist staff at the scene;
- notify senior MOEE management and coordinate the issuance of Minister's orders or directions as necessary; and,
- liaise with the agencies in charge of public safety in an emergency and coordinate MOEE's support for their efforts.

SAC staff make use of about 40 written operating procedures which guide them through the appropriate response procedures for a range of anticipated events. SAC procedures take into account the various provincial or inter-jurisdictional plans and agreements for dealing with spills and emergencies. These procedures are updated on a regular basis and new procedures are added as necessary. SAC procedures build on lessons learned from past incidents to remove much of the confusion which may otherwise occur during the initial response phase of subsequent events.

The Centre serves as a 24-hour access point to a wide range of Ministry resources which include district level off-hours field response capabilities, chemical experts and chemical database systems as well as computer modelers who can help predict contamination effects downwind or downstream and elaborate laboratory testing capabilities. SAC can also arrange for sophisticated Ministry mobile air monitoring units capable of measuring a wide range of airborne pollutants.

MINISTRY FIELD RESPONSE LEVELS

The Ministry has established the following three levels of field response for spills and related emergencies.

LEVEL 1 - District Response

Level 1 - District Response is the Ministry's first level of field response which is provided by district abatement staff during business hours and by on-call Environmental Response Personnel (ERP) during off-hours. Their responsibility for spills, or during emergencies with a spill component, is to provide or to facilitate the functions listed in Guideline G-1 and to trigger the next level of response, when necessary. Aside from being able to collect some samples and perhaps measure the acidity or alkalinity of water, their role is to provide an initial assessment and determine what actions need to be taken.

During a Level 1 field response, district staff may receive advice or assistance from other parts of the Ministry either directly or indirectly through the Spills Action Centre.

The Ministry's Environmental Response Program has been in place since 1986 to provide Level 1 field responses outside of regular business hours. Currently Level 1 field responses under this program are provided in accordance with the Ministry's Interim After-Hour Environmental Response Procedures (dated December 6, 1994). Under these procedures, 20 Environmental Officers across the province are "on-call" each week and, as per the collective working agreement, are required to respond within a "reasonable time" once they have been paged by SAC. Specifically, they are required to contact SAC within 30 minutes of being paged and then begin their response to the scene from the local Ministry office within two hours of telephone contact with SAC. Since the current procedures came into effect, the average response time to the scene of an after-hour occurrence has been 1 hour and 52 minutes which includes travel time from the district office to the scene.

When considering these field response times, it is important to recognize that it is not the Ministry's role to be a first responder at the scene of an emergency. The Ministry's immediate involvement in reported after-hour occurrences is provided by SAC through advice and direction given over the phone.

PLANNED LEVEL 1 - DISTRICT AFTER-HOUR RESPONSE

- *Respond to a page from SAC within 30 minutes and then begin response to scene from district office within 2 hours of speaking to SAC. Travel time to the scene varies with distance from the nearest district or area office*
- *Average Level 1 Ministry response time to the scene of after-hour events after being paged by SAC is 1 hr and 52 min.*

LEVEL 2 - Regional Response

Level 2 response is provided through expertise and resources available at the Regional level. This may include:

- (a) providing back-up staff and equipment for complex or prolonged incidents, in order to fulfil the functions listed in Guideline G-1.
- (b) providing air or water modeling or monitoring, in accordance with the Region's capability;
- (c) providing support, guidance and approval to initiate directions, approvals or orders under the Environmental Protection Act;
- (d) triggering the next level of response.

During a Level 2 response, regional staff may receive advice or assistance from other parts of the Ministry, such as the Environmental Monitoring and Reporting Branch, the Legal Services Branch and the Communications Branch.

The extent of Level 2 response capabilities for each of the Ministry's five regions varies. The West Central Region (Hamilton) and Eastern Region (Kingston) have the most advanced Level 2 response capabilities based on perceived need within these regions. Currently, in West Central Region, a modified recreational van is used as a control centre for Level 2 response. This van has a small consultation area, a computer with chemical information databases and modeling programs for estimating safety distances from toxic releases, several cellular phones, as well as a generator which is used to power on-board systems when the van is parked. The van also contains safety equipment, including respirators.

Air monitoring equipment available in the Level 2 van includes Gastec colorimetric tubes, which are used to monitor compounds in air. They measure at or above the occupational limits for a number of compounds and can provide results that are useful for giving safety advice during the early stages of air-related emergencies.

The other main instrument currently in use is a Photovac portable gas chromatograph. This instrument is much more sensitive than the Gastec tubes and will give readings for a number of compounds at or below Ministry standards for ambient air quality. The instrument mainly measures for the combustion-related and solvent compounds such as benzene, toluene, xylene, and ethyl benzene.

Unlike the Level 1 "on-call" system, Level 2 regional response staff do not carry pagers and are not on "on-call" duty. During the after-hours, the Spills Action Centre activates a Level 2 response by calling identified management staff at their home telephone numbers.

In general, Level 2 responders are expected to begin their response to the scene from the regional office (or other location where the Level 2 van is located) within 1 to 2 hours of being contacted by SAC or regional management.

PLANNED LEVEL 2 - REGIONAL AFTER-HOUR RESPONSE

- Begin response to scene from regional office within 1 to 2 hours of being contacted by SAC or regional management. This response time is normally in addition to the time it takes for a Level 1 response. Typically, Level 2 response staff can be expected to arrive on scene within 3 to 4 hours of the need being identified, depending upon travel time.*

LEVEL 3 - Head Office Response

Level 3 response utilizes additional Ministry expertise and resources beyond those available at the Regional level. This may include on-site assistance from other Branches, such as the Environmental Monitoring and Reporting Branch and the Communications Branch. Depending on the type of emergency, the services of the mobile Trace Atmospheric Gas Analyzers (TAGAs) may be required to provide specialized air monitoring including real-time concentration measurements of specific chemicals. This information may be used to help determine safe downwind concentrations and distances.

The two mobile TAGAs are generally used by the Ministry to investigate air pollution concerns raised by the public or Ministry staff. They continually operate from April to November conducting air quality surveys throughout the province. At any given time, the TAGAs can be in any Ontario community that requires specialized and unique monitoring. The TAGAs are operated by a team of scientists and technicians who have experience in analytical chemistry, meteorology, air quality analysis and investigating air pollution problems. The primary purpose of the TAGA units is to conduct air quality surveys across the province for the ministry's Operations Division. These units are not kept on standby in the Toronto area and, because they may be in use anywhere in the province, they are not always available for emergency response purposes. Emergencies such as the Plastimet fire consume a small fraction (less than 1 %) of the TAGA's operating time.

Ontario is one of very few jurisdictions in North America that puts this level of sophisticated equipment into the field for environmental response. In Canada, apart from Ontario, only Quebec possesses a TAGA which it acquired after one of Ontario's TAGAs responded to a large PCB site fire at St.Basille Le Grande, Quebec. Elsewhere, the states of New York and Pennsylvania operate one TAGA each and the U.S. EPA conducts Superfund site surveys with one TAGA.

To activate an after-hour Level 3 TAGA response, SAC pages the Manager responsible for Specialized Monitoring and Air Quality or alternatively, SAC calls the Director of the Environmental Monitoring and Reporting Branch. The Manager (or alternately the Director) then calls TAGA scientists or technicians at their home telephone numbers in order to identify at least two that are able to respond. TAGA staff are not required to carry pagers and be "on-call".

PLANNED LEVEL 3 - HEAD OFFICE AFTER-HOUR TAGA RESPONSE

- *Begin response to the scene within 3 to 4 hours of designated Management being contacted by SAC. This would normally be in addition to the Level 1 and Level 2 response times.*
Typically, a Level 3 TAGA response can be expected to be on site within 5 to 6 hours of the need being identified, depending on travel time. TAGA response times can increase if TAGA units are out doing surveys in other parts of the Province.

CHAPTER 3

INCIDENT DESCRIPTION - MOEE's RESPONSE

On the evening of Wednesday, July 9, a fire began at the Plastimet Inc. plant in Hamilton. An estimated 400 tonnes of polyvinyl chloride (PVC) and polyurethane foam were involved in the fire. The fire began between 19:00 hrs and 20:00 hrs and the Hamilton Fire Department notified the Ministry's Spills Action Centre (SAC) at **20:18** (8:18 PM). At that time it was believed that Polychlorinated Biphenyls (PCBs) might also be involved in the fire. The fire department requested that MOEE initiate a field response to provide assistance at the scene.

Immediately after receiving the notification from the Fire Department, SAC initially paged the Hamilton District Environmental Response Person (ERP) to activate a Level 1 response. About **11 minutes** after the initial report from the fire department, the Ministry's Hamilton Area Supervisor contacted SAC and advised that there were no PCBs at this site. SAC relayed this information to fire fighting officials on scene at **21:12**. The Area Supervisor also recommended that SAC page the Burlington District ERP because this individual was familiar with the Plastimet facility and lived closer than the Hamilton ERP. SAC paged the Burlington ERP at **20:37**. The Burlington ERP called SAC back within **2 minutes** and was ready to begin his response to the scene from the Burlington office in **44 minutes**. After experiencing some traffic problems on the QEW, the ERP arrived on scene **37 minutes** later, at about **22:00**.

ACTUAL LEVEL 1 - DISTRICT RESPONSE TO THE PLASTIMET FIRE

The ERP responded to the page from SAC within 2 minutes and then began his response to the scene from the Burlington district office within 44 minutes. Travel time to the scene was 37 minutes for a total response time of 1 hour and 23 minutes. The ERP arrived on scene 1 hour and 42 minutes after the initial notification to SAC.

While on route to the scene, the ERP observed the extent of the smoke plume and at 21:32 requested that SAC activate the Ministry's Level 2 air response group out of Hamilton. SAC made a series of phone calls and successfully contacted a Level 2 responder in Hamilton at **22:10**. The Level 2 responder went into the office to get the Level 2 response van within about **30 minutes** and arrived on scene within **50 minutes**, at about **23:00**. He then met with the ERP and authorities at the fire control centre to see what assistance was required.

ACTUAL LEVEL 2 - REGIONAL RESPONSE TO THE PLASTIMET FIRE

The West Central Region Level 2 Response person was at the Level 2 response van within 30 minutes and arrived on scene 50 minutes after being contacted by SAC which was within 2 hours and 40 minutes of the initial notification to SAC.

At about 23:36 the Level 2 responder discussed with SAC the need to place TAGA response staff on standby and obtain the assistance of Ministry modelers. The Regional Director supported this request at 23:45. There was about a 90 minute delay in reaching appropriate management at the Environmental Monitoring and Reporting Branch (EMRB), in part, because the primary management contact person was on vacation outside the province, and because SAC mistakenly read from the EMRB contact list rather than the actual TAGA call-out procedure. In the meantime the Level 2 responder prepared his equipment and at about **midnight**, one hour after reaching the site, began collecting air monitoring data for cyanides, acid gases, carbon monoxide, vinyl acetate and oxides of nitrogen. The results obtained, which did not support the need to evacuate, were provided to authorities at the fire control centre at about 01:15.

Following a teleconference between SAC management and Level 2 response staff at the scene, the Head of the Spills Action Centre contacted the Director of the EMRB at about 01:30 on July 10 to request a TAGA response. In addition, SAC staff were able to reach a Ministry modeler at home at about 01:46. At 03:37 the TAGA Pioneer was being switched to mobile mode and prepared for air monitoring duty. At 04:08, the TAGA Pioneer left its home base on Resources Road in Etobicoke and headed to Hamilton with a crew of three. Even though a planned police escort did not materialize the TAGA Pioneer arrived in the vicinity of the fire about 05:30, reported to the command post at 05:50 and began taking real-time samples at 05:58.

ACTUAL LEVEL 3 - HEAD OFFICE TAGA RESPONSE TO THE PLASTIMET FIRE

TAGA staff prepared equipment for mobile response and began their response to the scene within 2 hours and 37 minutes of SAC contacting the EMRB Director to request a TAGA response. The TAGA unit arrived on scene at 05:30 hrs. - 4 hours after the request by SAC, 5 hrs and 45 minutes after the initial request from the scene and 9 hrs and 10 minutes after the incident was first reported to SAC.

During the first 12 hours of this event, the Spills Action Centre dealt with about 90 related incoming and outgoing calls. For the most part, SAC staff were able to cope with this volume of calls, however, there were times when callers had to be put on hold for extended periods. Both SAC staff and Ministry field response staff had to deal with high-ranking officials from other agencies, as well as the media and local politicians. At times this distracted them from their primary duties.

When the stored material at Plastimet caught fire, it quickly became a major conflagration. Due to the intense heat of the fire and favourable weather conditions, the dense black smoke rose hundreds of metres into the air before spreading out and dissipating. Throughout the duration of the fire, wind speeds were very light. The first evening (Wednesday), winds blew the plume southwest over Hamilton. Although the wind was variable during the remainder of the night, by early morning the winds were again blowing from the north/northeast. The plume was still rising to considerable height and in the early morning was moving toward the Mountain area of Hamilton. Throughout the next day (Thursday), the plume was over downtown Hamilton for a five to six hour period as measured by the downtown air quality monitoring station. After this time, the winds were mainly from the westerly direction, blowing the plume through the north end of Hamilton and out over Lake Ontario.

During this time, levels of contaminants measured (such as hydrogen chloride) were above Ministry standards, but well below the Threshold Limit Values, (the occupational health limits that are often used in emergencies to determine short-term health impacts). Samples also showed elevated levels of compounds associated with combustion, like benzene and toluene.

In the early hours of July 11 (Friday), a significant change in conditions occurred. The firefighters had controlled the fire sufficiently so the plume height was not as great; there was an atmospheric thermal inversion; the Medical Officer of Health (MOH) received information that people were now reporting to the Emergency Departments of the hospitals and complaining of respiratory symptoms; and the firefighters were proposing a change in approach in attacking the fire. Since the walls of the building were still standing, the firefighters felt that the fire could continue to smoulder for a number of days. They were therefore, proposing to pull down the walls and attack the fire more aggressively with a large front-end loader.

Due to a combination of the above conditions, local authorities decided to call an evacuation. The evacuation was formally declared between 09:30 and 10:30 on Friday July 11. The evacuation comprised an area between Burlington and Barton Streets and Ferguson and Victoria Streets. About 4,000 people were evacuated. The Hamilton General Hospital and the Hamilton-Wentworth Detention Centre were not evacuated because these facilities were able to control their ventilation systems to protect occupants. The evacuation lasted for about 24 hours.

The evacuation was called off on the morning of July 12 (Saturday), due to reports from the firefighters that the fire was practically extinguished. Also, air monitoring data showed a dramatic drop-off in compounds associated with the fire emissions, such as hydrogen chloride and benzene. There was considerable concern over the black soot fallout both in downtown Hamilton and on the Mountain. Some fallout was also reported more than ten kilometres from the site. As a safety precaution, the Medical Officer of Health issued an advisory that people should not eat vegetables which they could not peel and asked that children not play in the backyards until testing had been completed for dioxins.

On July 12 (Saturday), intensive soil, vegetation and vegetable monitoring began. Samplers focused on the area closest to the fire, but also included areas from which complaints had been received, e.g. the Gage Park area. Comprehensive soil and vegetation surveys continued for weeks after the fire was out. On Friday, July 25 (16 days after the fire began) the MOH removed the advisory on children playing in backyards and the caution about eating vegetables. Due to

public health concerns, dioxin results received the most attention for soil and vegetation sampling. Tests were also performed for metals and other compounds.

Water sampling began on the night of the fire, both in the sewer upstream and downstream, in fire runoff water and in the Wellington Street slip which leads into Hamilton harbour. Most contaminants detected in the surface water were at low concentrations and declined shortly after the fire.

In total, the Ministry sampled at well over 200 sites and performed thousands of tests in order to provide a timely assessment of the effects of the Plastimet fire. Results obtained were effectively used by both Ministry staff and other response agencies to help determine appropriate response and precautionary actions.

CHAPTER 4

AIR MONITORING RESULTS

The first air monitoring performed on-site was carried out by Level 2 Response personnel from the Ministry's West Central Region Level 2 van. This sampling began about midnight and was done using Gastec colorimetric tubes to monitor for cyanides, acid gases, carbon monoxide, vinyl acetate, and oxides of nitrogen. These results, which did not support the need to evacuate, were reported to the Acting Mayor, and the Head of the Hamilton-Wentworth Health Unit at about 01:15 on July 10. Visual observations of the plume were also conveyed at that time.

The next sampling performed was done using a Level 2 portable gas chromatograph. This device is much more sensitive than the Gastec tubes and it is capable of analyzing a limited number of compounds. Normally it is configured to sample for benzene, toluene, and xylenes and throughout this emergency was used mainly to focus on benzene as a tracer compound to indicate the overall behavior of the smoke plume.

The Ministry had set up nearby equipment for routine dioxin air samples. This was done prior to the fire as part of regular air monitoring and was set to begin at midnight on the first night of the fire. A 24 hour sample was collected and rushed to the Ministry's laboratory where the analysis was completed by the afternoon of July 12 (Saturday). The result was then evaluated by dioxin specialists and public health officials prior to being released to the public.

The first TAGA (TAGA Pioneer) arrived within the vicinity of the fire shortly after 05:30 on July 10 (Thursday). The TAGA Pioneer crew met with command post representatives at about 05:50 and began taking real time samples at 05:58. Levels of hydrogen chloride - HCl (an expected component of the fire emissions) were found to be in the range of 700 $\mu\text{g}/\text{m}^3$ which was higher than the Ministry's half hour standard of 100 $\mu\text{g}/\text{m}^3$ but substantially lower than the occupational limit of 7,000 $\mu\text{g}/\text{m}^3$ (i.e. the Threshold Limit Value).

The other TAGA (TAGA Explorer) arrived on scene at about 12:07 on July 10, (it was in a Mississauga service station overnight for maintenance to the vehicle) and immediately began to monitor for volatile organics, including vinyl chloride, benzene, 1-3 butadiene, chlorobenzene, styrene, toluene, and naphthalene. Elevated levels of most of these compounds were measured downwind of the fire site. For details on the monitoring capabilities of the TAGA units see Appendix I.

Further air samples were taken at the Hospital and Detention Centre upon request. Samples were taken for airborne particulate in order to analyze for metals. The results showed an exceedance of the twenty-four hour ambient air quality criteria for nickel, lead, and chromium. Transient exceedances of this nature and duration are unlikely to be of any significance in the context of an annual average. Polyaromatic Hydrocarbon (PAH) measurements on July 10 and 11 (Thursday and Friday) were all at normal levels. PCB monitoring was also performed and all levels measured were below the Ministry's 24 hour ambient air quality criteria.

Carbon monoxide and nitrogen oxide monitors were installed in one of the TAGA units to give real-time values for these compounds. Also, during the initial stages of the fire, effects were detected at several of the Ministry's air quality monitoring stations in Hamilton. The pollutant monitor most affected was the coefficient of haze tape sampler which measured high levels of particulate.

The above monitoring results and observations were conveyed to authorities at the command centre to aid in evacuation decisions as the data became available.

In the very early hours of Friday morning, the visual appearance of the plume changed - it began to hug the ground, was visually more dense, and levels of contaminants such as benzene began to rise dramatically. An evacuation was called between 09:30 and 10:30. High levels of hydrogen chloride were also measured by the TAGA Pioneer when it came back on-station after pump-down (a necessary procedure during sampling) by 11:40 on July 11 (Friday). Onsite TAGA results (indoor and outdoor) were used by the Medical Officer of Health in deciding not to evacuate a nearby detention centre and hospital. By about 06:00 on July 12 (Saturday) levels of contaminants dropped off sharply, which, together with reports from the fire department that the fire was extinguished, led to the decision to lift the evacuation.

It is important to note that while air monitoring results were quite useful, the authorities in the fire control group including the Medical Officer of Health, did not rely solely on these results to make decisions concerning the need to evacuate or shelter. Other factors considered included visual observations of the plume, changing atmospheric conditions, reported respiratory symptoms and changes in fire fighting strategies.

Details of the TAGA monitoring results are provided in Appendix II (A) HCl and Appendix III (B) VOCs. The two TAGAs (Pioneer and Explorer) recorded over 100 hours of realtime measurements for HCl and VOCs. Hydrogen chloride levels exceeded MOEE half-hour standards in approximately fifty percent of the samples. Instantaneous levels of HCl were as high as 930 $\mu\text{g}/\text{m}^3$ which is well below the occupational limit of 7000 $\mu\text{g}/\text{m}^3$. Most of the monitoring was conducted within hundreds of metres of the fire site. Hydrogen chloride levels returned to baseline levels immediately after the fire was extinguished in the early afternoon of July 12 (Saturday).

The VOC monitoring results showed elevated levels of benzene, vinyl chloride, 1,3 butadiene, chlorobenzene, styrene, toluene, and naphthalene downwind of the fire. Only naphthalene exceeded the MOEE standard of 36 $\mu\text{g}/\text{m}^3$, in 2 of 55 samples. There were also elevated levels of VOCs in the detention centre as measured on July 10 (Thursday). However, these were generally below existing Ministry point of impingement standards.

CHAPTER 5

OBSERVATIONS

1. The Ministry's Level 1 field response was timely and appropriate. The Burlington Environmental Response Person (ERP) responded to the page from SAC in 2 minutes, was at the district office to pick up ERP vehicle in 44 minutes and was on scene within 1 hour and 23 minutes of being paged by SAC. After observing the plume on route to the fire he recommended a Level 2 Ministry response almost half an hour before his arrival on scene.
2. The MOEE Hamilton Area Supervisor called SAC 11 minutes after the initial report from the fire department to provide valuable and timely advice concerning the nature of the Plastimet facility (i.e. that no PCBs were stored onsite) and suggested that SAC activate the Burlington ERP who lived closer and was familiar with the Plastimet facility.
3. The Level 2 response to the Plastimet fire was very timely. The first Level 2 responder was on scene within 50 minutes of being contacted by SAC. After meeting with the ERP and authorities at the fire control centre and then requesting Level 3 response from SAC, he began taking air monitoring samples at midnight.
4. When it was determined that the Ministry's Level 2 response was not able to provide sufficient information for the Medical Officer of Health to be comfortable with her decision not to evacuate, it was explained to that the Ministry's Level 3 response would take 5 to 6 hours, if the TAGAs were even available to respond. In fact, the first TAGA arrived in Hamilton about 5 hours and 45 minutes after the request by West Central Region management. That being said, procedural difficulties were experienced in activating Level 3 air modelers and TAGA response staff. Numerous pages and phone calls were required before modelers could be reached. There was also about a 90 minute delay in SAC initiating a TAGA response once the need was identified in the field. However, much of this time was recovered when the TAGA scientists required only 2 hours and 37 minutes (as opposed to the normal 3 to 4 hours) to report back to work, ready their equipment and begin their response to the scene. The TAGA unit arrived in the vicinity of the fire about 4 hours after SAC contacted the Director of EMRB to initiate the response.
5. Available information, including the detailed TAGA monitoring results supported the initial assessment by municipal authorities and Ministry experts that, due to weather conditions prevailing at the time, the plume would not likely impact local inhabitants. An earlier TAGA arrival on scene would not have resulted in an earlier evacuation call. When an evacuation was ultimately called (more than 24 hours after the TAGA arrived on scene) the decision was based on a range of factors including visual observations of the plume, changing atmospheric conditions, reported respiratory symptoms and a change in the firefighting strategy.

6. Air monitoring measurements (summarized in Appendix II) for contaminants such as hydrogen chloride were all well below the Threshold Limit Values. These are the occupational health limits that are used in emergencies to determine short term health risks. Both indoor and outdoor TAGA measurements were used by the Medical Officer of Health in deciding not to evacuate a nearby detention centre and hospital.
7. Communications play an important role during events of this magnitude and the benefits of a 24-hour "call centre" are readily apparent. During the first 12 hours of this event (i.e. up to the start of the next business day) the Spills Action Centre handled about 90 related incoming and outgoing calls. For the most part SAC staff were able to cope with this volume of calls, but a number of callers had to be put on hold. SAC did experience communications problems when trying to reach staff by means of pagers and there were also periodic difficulties in reaching staff on scene via cellular phones.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The internal review concludes that the Ministry responded to the Plastimet fire in accordance with Ministry Guidelines and Procedures.

RECOMMENDATIONS

1. Review the state of Level 2 response capabilities in each of the Ministry's five regions to develop a consistent approach for activating these resources during the after-hours. Level 2 response procedures should be reviewed and tested annually.
2. While procedural difficulties in activating a Level 3 response to this occurrence have already been corrected, it is recommended that these procedures be reviewed and tested annually to ensure they are understood and can be relied upon. In addition, a Level 3 response capabilities section should be added to the Ministry's Environmental Responders training course.
3. Clarify procedures for providing additional Ministry personnel to support Level 1 and Level 2 responders during the early stages of complex emergencies of this nature and magnitude.
4. Clarify the Ministry's role and capabilities by updating and distributing the Ministry's Spills Information Booklet and clearly communicating this information with local governments and the public.
5. Evaluate alternative communication systems that may be of benefit during major events and mechanisms for conveying information to other agencies and the public in a timely manner.

APPENDIX I

CAPABILITIES OF THE MOBILE TAGAs FOR LEVEL 3 EMERGENCY RESPONSE

Capabilities of the Mobile TAGAs for Level 3 Emergency Response

Depending on the type of emergency, the Region or the Spills Action Centre, may request the services of the mobile Trace Atmospheric Gas Analyzers (TAGA) of the Environmental Monitoring and Reporting Branch (EMRB) for specialized air monitoring including real-time concentration measurements of specific chemicals - this is referred to as "Level 3" response - TAGA information may be used to help determine safe downwind concentrations and distances, which is extremely useful at times when evacuation is necessary.

THE MOBILE TAGAs

MOEE currently operates two mobile TAGA 6000 tandem mass spectrometer (MS/MS) units: the "Pioneer" since 1987 and the "Explorer" since 1991. These units are housed in two 30' long Orion buses. Each unit cost the province approximately \$ 1.2 million. The TAGA Pioneer is used primarily for real-time detection of pollutants, tracking down pollution sources, characterization of odors, and, when necessary, respond to emergencies such as chemical spills or fires. The TAGA Explorer is currently dedicated to on-site monitoring of selected volatile organic compounds (VOCs). The data have been used in publications, health-risk assessments, abatement programs, judicial proceedings and in decision-making for evacuation during emergencies.

The TAGA "Pioneer"

The TAGA Pioneer was developed in the late 80's to provide real time monitoring capabilities from a moving platform. The APCI (atmospheric pressure chemical ionization) technique is used to monitor air pollutants in real-time. Air is sampled directly into the ionization chamber of the TAGA where parent ions of chemicals are formed and are immediately subjected to single MS analysis followed by MS/MS techniques for pollutant identification. Owing to the TAGA's unique features of direct air sampling, the APCI technique is highly sensitive to many *volatile* polar organic compounds which contain a heteroatom such as N, O, P, S or halide. The real-time detection limits range from 0.01 to a few ppb, depending on the type of chemical and the complexity of the sample matrix. Unique capabilities of the mobile TAGA in direct air sampling APCI mode are listed below.

Chemical Fingerprinting: Chemical characterization of source and fugitive emissions, particularly odors, is achieved by the TAGA's well established fingerprinting technique involving comparison of mass spectra of ambient air and library spectra of known chemicals. Over 500 air pollutants can be identified using the current TAGA library spectrum. This unique real-time feature is valuable for rapid on-site identification of unknown chemicals and also useful at times when chemical differentiation is required among emission sources in close proximity.

Plume Tracking: Tracking of specific air pollutants to their emission source is achieved by driving the mobile TAGA slowly around the suspected source. Data are used for concentration isopleths in the vicinity of the source and determination of point-of-impingement locations which in turn are used for stationary monitoring.

Half-hour Concentration Determinations: Once the target compounds are determined by the chemical finger printing, half-hour concentrations of selected compounds are determined at locations where the highest real time levels were observed during plume tracking exercises.

Emergencies: The TAGA has responded to many emergencies including chemical spills, fires and the unexpected release of chemicals during cleanup of contaminated sites.

The TAGA 3000 (single MS), the predecessor to the current TAGA 6000s, was instrumental in three high profile environmental emergencies:

1979: Mississauga Derailment (chlorine)

1982: Medonte Derailment (hydrogen fluoride)

1988: St Basille Le Grande PCB warehouse fire (polychlorinated biphenyls)

The TAGA 6000 (Pioneer) has responded to the emergencies listed below:

1990: Tire fire in Hagersville. The TAGA Pioneer monitored air emissions for 17 consecutive days, until the 13-million tire fire was completely extinguished and air emissions had ceased.

1990: Pesticide and fertilizer warehouse fire in Harrow. The TAGA Pioneer monitored emissions for several hours in the residential area close to the warehouse.

1990: Tire fire in Stouffville. The TAGA Pioneer monitored emissions for several hours near a school and community center.

1995: One day on standby (during work hours) for emergency response. Chemical explosion (phenol and formaldehyde) on Comstock Road in Scarborough.

1996: One day on standby (during work hours) for emergency response. Fire of styrofoam materials at the railway yard of Sheppard/McCowan in Scarborough.

1996: One day on standby (during work hours) for emergency response. Fire of multi-thousand liters gasoline storage tank at Sunoco in Sarnia.

1996: Henkel Canada in Hamilton. Very offensive odors were noticed while excavating a chemically contaminated site adjacent to a school. TAGA monitoring was requested immediately. Within an hour the TAGA responded to this emergency and monitored odors for eight hours. The TAGA results greatly assisted in the health risk assessment which was required on-site as soon as possible.

1997: Plastics fire (Plastimet) in Hamilton. Over 400 tonnes of plastic items stored in a warehouse for recycle were burning for three days. The TAGA Pioneer was dispatched to monitored for hydrogen chloride for three days until the fire was completely extinguished. TAGA on-site results were used by the Medical Officer of Health prior to evacuation of four thousand residents in the vicinity of the fire.

The TAGA "Explorer"

Following the Hagersville tire fire the EMRB developed a TAGA-based VOC monitoring technique which became the primary function of the TAGA Explorer. On-site sampling and immediate VOC analysis is extremely important to eliminate possibilities of sample alterations due to chemical transformations and losses while samples are transported to laboratories for analysis, often several hours or days later. Also the superior resolving power of the TAGA MS/MS system allows for specific analysis of individual VOCs in very complex air samples, such as those resulting from fire. The mobile TAGA Explorer is specifically developed for on-site measurements of air toxics. Identification of emissions can be easily achieved by on-site analysis of a series of cartridge samples taken downwind of the source. Unlike conventional laboratory-methods, the mobile TAGA Explorer allows for immediate examination of the results which is particularly useful in situations of environmental emergencies when decisions for ensuring public safety have to be made.

Emergencies: The TAGA Explorer has responded to two emergencies.

1996: Gasoline spill at the Imperial Oil (ESSO) distribution terminal near Finch/Keele in Downsview. Gasoline vapors were monitored for several hours until concentrations decreased to acceptable levels, and gasoline odors diminished.

1997: Plastics fire (Plastimet) in Hamilton. Over 400 tonnes of plastic items were burning for three days. The TAGA Explorer monitored for 50 selected VOCs including benzene and vinyl chloride, for three days until the fire was completely extinguished. The TAGA on-site results (indoor and outdoor) were used by the Medical Officer of Health in deciding not to evacuate a nearby detention center and a nearby hospital.

APPENDIX II (A) - TAGA PIONEER RESULTS
(B) - TAGA EXPLORER VOC RESULTS

APPENDIX II(A)

**Mobile TAGA Pioneer (Real-Time HCl Measurements)
PLASTIMET FIRE (HAMILTON) July 10 - 12, 1997**

Date	Time	Period	WD	WS (km/hr)	AT (C)	Location	Sample ID	HCl (½ hr Average)	HCl Instan. Max.
July 10	06:41-07:11	-	calm	15		Wentworth & Wilfred	P01	na	530
	07:17-07:47	-	calm	17		Mountain Park & Belwood	P02	na	300
	07:48-08:18	-	calm	17		Mountain Park & Belwood	P03	na	280
	08:21-08:51	E	3	17		Wellington & Ferrie	P04	na	190
	10:41-11:11	E	8	20		Barton & Elgin	P05	na	580
	11:59-12:29	E	7	22		on Elgin near Detention Centre	S01	500	780
	12:33-13:03	E	8	23		on Elgin near Detention Centre	S02	470	760
	13:03-13:33	E	9	23		on Elgin near Detention Centre	S03	230	720
	13:36-14:06	E	10	24		on Elgin Detention Centre	S04	150	520
	14:26-14:56	E	6	24		Wellington & Barton	P06	na	160
	14:59-15:29	E	4	24		on Victoria near hospital	P07	na	290
	15:31-16:01	E	11	24		on Wellington 100m N of Barton	S05	320	770
July 11	11:07-11:37	NW	7	24		Birge & Wellington	P08	na	690
	11:40-12:10	NW	10	24		on Birge 30m E of Wellington	S06	700	930
	12:14-12:44	W	10	23		on Birge 30m E of Wellington	S07	510	840

Date	Time	Period	WD	WS (km/hr)	AT (C)	Location	Sample ID	HCl (½ hr Average)	HCl Instan. Max.
	12:48-13:18	W	10	23		on Birge 30m E of Wellington	S08	260	760
	13:24-13:54	W		25		Victoria & Ferrie	P09	na	520
	13:56-14:26	WSW	6	25		on Ferrie 40 m E of Victoria	S09	370	830
	14:28-14:57	WSW	8	25		Victoria & Ferrie	.P10	na	590
	14:57-15:27	WSW	10	25		on Beach 200m E of Kenilworth	S10	45	175
	15:28-15:58	WSW	9	25		on Beach 200m E of Kenilworth	S11	28	53
	15:59-16:29	WSW	7	25		Victoria & Burlington	P11	na	130
	16:31-17:01	W	6	26		on Wellington 20 m N of Barton (upwind)	S12	less than 10	less than 10
	17:04-17:11	W	10	26		Victoria & Burton	P12	na	590
	17:12-17:42	W	10	26		on Ferrie 40m E of Victoria	S13	160	720
	17:54-18:24	SW	10	26		on Ferrie 40m E of Victoria	S14	110	470
	18:29-18:59	WSW	9	26		on Ferrie 40m E of Victoria	S15	250	710
	19:10-19:40	WSW	8	25		Victoria & Burlington	P13	na	350
	19:43-20:13	WSW	10	25		Victoria & Burlington	P14	na	650
	20:15-20:45	W	8	23		on Victoria 50m S of Ferrie	S16	270	600
	20:59-21:27	WSW	16	22		Victoria & Ferrie	P15	na	450
	21:27-21:57	WSW	6	22		on Victoria 20m N of Ferrie	S17	250	590
	21:58-22:28	WSW	7	22		on Victoria 20m N of Ferrie	S18	270	620
	22:33-23:03	SW	8	21		on Victoria 20m N of Ferrie	S19	41	98

Date	Time Period	WD	WS (km/hr)	AT (C)	Location	Sample ID	HCl (½ hr Average)	HCl Instan. Max.
	23:22-23:55	WSW	7	21	on Victoria near Barton	S20	370	740
	23:55-00:25	W	7	21	on Victoria near Barton	S21	390	740
July 12	00:57-01:27	NW	4	21	on Wellington 50m N of Barton	S22	65	480
	01:28-01:58	WSW	4	20	on Wellington 50m N of Barton	S23	220	750
	02:13-02:43	WSW	4	20	on Victoria 15m S of Barton	S24	480	750
	02:43-03:13	WSW	5	19	on Victoria 15m S of Barton	S25	330	620
	03:14-03:44	WSW	5	19	on Victoria 15m S of Barton	S26	390	730
	03:44-04:14	W	6	19	on Victoria 15m S of Barton	S27	440	700
	04:16-04:46	W	4	18	on Victoria 15m S of Barton	S28	350	630
	04:48-05:18	W	4	18	on Victoria 15m S of Barton	S29	400	620
	05:18-05:48	W	6	19	on Victoria 15m S of Barton	S30	280	540
	05:49-06:19	W	6	19	on Victoria 15m S of Barton	S31	56	160
	13:40-14:24	W	10	28	Victoria & Barton (fire out)	P16	na	less than 20
	14:26-14:56	W	13	29	50m S of Ferrie 40m E of Wellington	S32	less than 20	less than 20
	15:19-15:49	W	13	29	Barton & Wentworth	P17	na	less than 20

Notes: Meteorological data obtained from the TAGA on-board meteorological station and the MOEE meteorological station at Woodward Sewage Treatment Plant in Hamilton.

All HCl data are in $\mu\text{g}/\text{m}^3$

Half-hour average concentrations and maximum instantaneous levels of HCl ($\mu\text{g}/\text{m}^3$) during monitoring at fixed locations (S01 - S32) and maximum instantaneous levels of HCl ($\mu\text{g}/\text{m}^3$) detected during plume tracking (P01 - P17)

APPENDIX II(B)

TAGA EXPLORER VOC RESULTS Mobile TAGA Explorer VOC Half-Hour Concentrations, Plastimet Fire (Hamilton), July 10-12, 1997

Date Number	Sample Time	Start Site	Location in $\mu\text{g/m}^3$	vinyl chloride in $\mu\text{g/m}^3$	benzene in $\mu\text{g/m}^3$	1,3-butadiene in $\mu\text{g/m}^3$	chlorobenzene in $\mu\text{g/m}^3$	styrene in $\mu\text{g/m}^3$	toluene in $\mu\text{g/m}^3$	naphthalene in $\mu\text{g/m}^3$
Jul 10	CS01	12:22	indoor Detention Centre basement	1.7	53	20	10	44	42	22
	CS02	12:30	indoor Detention Centre 3rd floor	1.7	53	22	2.7	48	44	29
	CS03	12:34	indoor Detention Centre mechanical room	1.6	56	20	2.6	47	42	36
	CS04	12:34	indoor Detention Centre mechanical room	1.6	56	21	2.5	44	40	36
	CS05	12:48	outdoor DW NE corner Barton & Elgin	0.86	38	12	5.9	31	32	27
	CS06	14:10	outdoor DW Wellington 200m N of Barton	0.07	6.8	1.0	0.04	5.4	14	2.7
	CS07	14:10	outdoor UW End of Ferrie	.09	2.1	0.09	-	0.34	3.6	0.69
	CS08	14:29	outdoor DW NE corner Barton & Elgin	0.64	33	10	1.0	30	25	9.7
	CS09	14:40	outdoor DW Wellington 200m N of Barton	0.31	17	3.6	0.49	18	15	3.9
	CS10	14:40	outdoor UW End of Ferrie	-	2.0	det ^(b)	-	0.36	2.5	0.25
	CS11	20:42	outdoor DW Victoria, 200m S of Burlington	1.3	34	12	4.5	26	23	13
	CS12	21:12	outdoor DW Victoria, 200m S of Burlington	0.34	12	2.3	0.91	9.0	7.4	2.3
	CS13	22:12	outdoor DW Victoria, 200m S of Burlington	0.19	7.1	1.5	0.52	6.1	4.6	1.9
	CS14	22:42	outdoor DW SE corner of Wellington & Ferrie	2.1	54	22	8.6	37	44	22
	CS15	23:12	outdoor DW SE corner of Wellington & Ferrie	1.7	47	18	6.3	34	38	19
	CS16	23:12	outdoor DW NW corner of Victoria & Ferrie	1.5	36	10	4.4	27	25	8.6
	CS17	23:12	outdoor UW NE corner of Barton & Elgin	-	1.6	0.20	-	0.44	5.0	0.51
Jul 11	CS18	01:30	outdoor DW Slater Steel, SW corner of Sherman & Brant	0.60	28	2.2	2.3	24	36	7.3
	CS19	02:00	outdoor DW Slater Steel, SW corner of Sherman & Brant	0.28	21	1.2	1.9	16	19	5.6
	CS20	03:00	outdoor DW Allen Candy, 356 Emerald	0.86	34	4.8	4.8	20	36	11
	CS21	03:30	indoor Allen Candy, 356 Emerald	1.62	49	14	7.2	36	45	16
	CS22	04:00	outdoor DW Victoria & Ferrie	0.56	28	2.4	2.8	13	30	8.7
	CS23	05:00	outdoor DW Victoria & Shaw	2.9	66	23	15	30	47	17
	CS24	06:00	outdoor DW Victoria & Barton	2.5	79	27	17	>50	67	43
	CS25	07:00	outdoor DW Victoria & Sawyer	2.9	82	28	18	>50	66	46
	CS26	09:07	outdoor DW NW corner of Victoria & Ferrie	0.60	23	4.4	1.9	15	23	5.7
	CS27	09:07	outdoor DW SW corner of Wentworth & Macallum	0.19	13	2.1	0.62	7.1	19	2.6
	CS28	09:07	outdoor UW NE corner of Barton & Elgin	-	2.1	0.22	-	0.41	15	0.58
	CS29	10:07	outdoor DW NW corner of Victoria & Ferrie	0.15	6.1	1.3	0.40	6.7	5.2	1.8
	CS30	10:07	outdoor DW SW corner of Wentworth & Macallum	-	2.3	0.14	0.07	0.42	2.8	0.37
	CS31	10:47	outdoor UW NE corner of Barton & Elgin	-	1.5	0.20	-	0.21	5.9	0.28
	CS32	12:15	outdoor DW NW corner of Victoria & Ferrie	det	0.79	0.20	-	4.8	5.3	1.8
	CS33	14:16	outdoor DW Sawyer, 100m W of Victoria	0.53	18	4.2	1.9	13	9.9	4.6
	CS34	14:46	outdoor DW Sawyer, 100m W of Victoria	0.75	22	6.6	2.4	15	13	4.9
	CS35	15:16	outdoor DW Sawyer, 100m W of Victoria	0.82	23	6.2	2.8	16	13	5.6
	CS36	15:46	outdoor DW Sawyer, 100m W of Victoria	0.97	30	8.9	3.5	21	18	9.1

			Detection Limit	0.01	0.05	0.02	0.01	0.01	0.02	0.03
			Ministry Standard	3 (S,H)	na	na	na	400 (S,O)	2000 (S,O)	36 (S,O)
CS37	16:16	outdoor DW	Sawyer, 100m W of Victoria	0.25	9.7	1.9	1.0	7.8	5.6	1.2
CS38	16:46	outdoor DW	Sawyer, 100m W of Victoria	0.58	18	4.8	1.7	14	11	4.8
CS39	17:16	outdoor DW	NW corner of Shaw & Victoria	0.40	13	3.1	1.1	11	8.4	3.6
CS40	17:46	outdoor DW	NW corner of Shaw & Victoria	0.75	22	5.8	2.5	17	15	6.4
CS41	18:16	outdoor DW	NW corner of Shaw & Victoria	0.59	19	5.2	1.9	16	13	4.8
CS42	18:46	outdoor DW	NW corner of Shaw & Victoria	0.67	21	4.7	2.5	16	16	5.2
CS43	20:00	outdoor DW	SE corner of Barton & Victoria	det	3.1	0.73	0.13	1.1	5.6	0.69
CS44	21:00	outdoor DW	SW corner of Ferrie & Victoria	0.28	16	2.9	1.2	13	23	3.8
CS45	22:00	outdoor DW	Ferrie, 100m W of Victoria	0.23	15	1.6	0.74	6.7	17	0.79
CS46	23:00	outdoor DW	SE corner of Barton & Victoria	1.2	39	11	6.1	22	45	15
Jul 12										
CS47	01:30	outdoor DW	Wellington, 100m N of Barton	0.70	14	5.5	1.5	27	11	11
CS48	04:47	outdoor DW	Victoria & Barton	0.91	40	6.2	5.0	20	30	7.5
CS49	06:48	indoor	Hospital Cardiac Care Unit	0.07	2.9	0.30	0.10	1.3	9.6	1.3
CS50	07:30	outdoor DW	Victoria & Barton	-	7.2	0.38	0.16	6.0	17	1.1
CS51	09:00	outdoor DW	near fire site on Wellington, 300m S of Ferrie	0.22	49	2.5	2.2	50	44	9.1
CS52	09:30	outdoor DW	near fire site on Wellington, 300m S of Ferrie	0.16	6.0	3.9	0.38	39	14	11
CS53	10:10	outdoor DW	near fire site on Wellington, 250m S of Ferrie	0.21	11	2.8	2.2	50	42	5.6
CS54	10:51	outdoor DW	near fire site on Wellington, 200m N of Barton	0.18	35	1.7	2.2	39	37	7.5
CS55	11:21	outdoor DW	near fire site on Wellington, 200m N of Barton	0.11	26	0.95	1.2	29	26	5.8

Notes:

1. " =not detected, below the detection limit; det=detected, above the detection limit but less than 3.3 times of the detection limit.
2. Summary of Point of Impingement Standards, Ambient Air Quality Criteria and Approvals Screening Levels, MOEE, June 14, 1994; na =not available; S=air quality standard; IS=interim standard; H= based health effect; O=based on odours.



